Accounting and Allocation Manager Component Binding

Status of this Memo

This is an interface specification for the Scalable Systems Software (SSS) Accounting and Allocation Manager component. Every SSS-compliant implementation of an Accounting and Allocation Manager component must conform to this specification. Guidance is provided as to what MUST, SHOULD and MAY be implemented. Individual applications may support additional features of the SSSRMAP specification and have custom objects and actions that should be documented in an Application Binding document.

Abstract

The Scalable Systems Software Accounting and Allocation Manager Component uses the SSSRMAP Wire Protocol and SSSRMAP Message Format as its standard interface. This document describes how the Accounting and Allocation Manager component implements these specifications, which features are supported, what meanings are associated with the fields and values, and which objects, actions and attributes may be understood by the component.

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1. Introduction

2. Overview

This document describes the binding between the Accounting and Allocation Manager component and the SSSRMAP specification. It specifies what properties of the specification are utilized, what the meanings are, and in general how to construct the messages and responses for the component. It enumerates the valid objects, actions and options for all valid requests and responses.

3. Wire Protocol

Scalable-Systems-Software-compatible Accounting and Allocation Manager components MUST use the SSSRMAP v3 Wire Protocol for framing and security.

3.1 The *Envelope* Element

No *Envelope* attributes are required. If the *component* attribute is specified, it MUST have a value of "AllocationManager".

3.2   Transport Layer

This component uses the TCP/IP transport layer according to the SSSRMAP specification.

3.3   Framing

This component uses the HTTP 1.1 POST protocol as per the SSSRMAP specification. Chunked encoding is used for large message segmentation. The message and reply payloads are single XML documents having a root element of *Envelope*.

3.4   Asynchrony

Asynchrony is not currently supported by the Accounting and Allocation Manager component.

3.5   Security

3.5.1 Security Tokens

Conforming components MUST support Symmetric security tokens and SHOULD support Password tokens.

3.6   Authentication

Authentication MUST be supported by a conforming component.

3.7   Privacy

Encryption SHOULD be supported by a conforming component.

4.   Message Format

Scalable Systems Software compatible Accounting and Allocation Manager components MUST use the SSSRMAP Message Format for encoding and SHOULD be able to validate against the SSSRMAP schema http://www.scidac.org/ScalableSystems/SSSRMAP sssrmap3.xsd. The data

representation follows the specification's conventions for capitalization and naming.

4.1 Requests and Responses

The *Request* element MUST specify the *action* and *actor* attributes. The *id* attribute is not used since asynchrony is not yet supported by any implementation.

4.2 Valid Objects

Valid objects for the Accounting and Allocation Manager are listed in the Object Tables. For each of these objects, the corresponding actions and attributes are listed.

4.3 Valid Actions

Valid actions for a particular object are listed in the Object Tables. Every object supports a *Query* action. Most objects also support *Create*, *Modify*, and *Delete* actions. Some objects will support additional actions.

4.3.1 The *Create* Action

The *Create* action creates new objects. Only *Set* or *Option* elements are allowed as content for *Create* requests. A *Create* request MUST specify all of the created object's required attributes, and MAY specify any of this object's other attributes.

4.3.2 The *Query* Action

The *Query* action retrieves any set of attributes from any expressible set of objects, in a user-specified order. *Query* requests may contain *Get*, *Where* and *Option* elements. *Get* elements identify the fields to retrieve, the order in which to retrieve them, and, in the case of a multi-object query, which objects they belong to. *Where* elements characterize the objects to retrieve.

Every *Query* request should have at least one *Get* element in order to be well-defined. Responses to *Query* requests that lack *Get* elements are purely implementation-dependent, and may contain any number of fields (including all or none), in any order.

A *Query* request may use any number of *Where* elements to select the objects to retrieve. Any of the objects' attributes may be used to make this selection.

4.3.3 The *Modify* Action

The *Modify* action modifies one or more objects. *Modify* requests may contain *Set*, *Where* and *Option* elements. *Set* elements identify the fields to change. *Where* elements characterize the objects to change.

Every *Modify* request must specify at least one *Set* element. *Modify* requests may not modify any attributes that determine an object's identity (i.e., that constitute an object's primary key).

A *Modify* request may use any number of *Where* elements to select the objects to modify. Any of the objects' attributes may be used to make this selection.

4.3.4 The *Delete* Action

The *Delete* action deletes one or more objects. *Delete* requests may contain *Where* and *Option* elements. *Where* elements characterize the objects to delete.

A *Delete* request may use any number of *Where* elements to select the objects to delete. Any of the objects' attributes may be used to make this selection.

4.3.5 The *Undelete* Action

The *Undelete* action reverses a previous deletion for one or more objects. *Undelete* requests may contain *Where* and *Option* elements. *Where* elements characterize the objects to undelete. Note that it is strictly optional for an implementation to support the Undelete action.

An *Undelete* request may use any number of *Where* elements to select the objects to undelete. Any of the object attributes may be used to make this selection.

4.3.6 Other Actions

Other, object-specific Accounting and Allocation Manager actions include *Balance*, *Charge*, *Deposit*, *Quote*, *Refresh, Refund, Reserve*, and *Withdraw*. Each of these actions is described below, in the context of its associated object(s).

4.4 Valid Attributes

An object's attributes consist of those of its data fields that may be named in *Get*, *Set*, and *Where* elements. The Object Tables list the valid attributes for every Accounting and Allocation Manager Object, by object type.

4.5   The *Get* Element

Get elements indicate the fields to be returned in a query. *Get* elements support the *name* attribute, which is REQUIRED, the *op* and *object* attributes, which are OPTIONAL. The *op* attribute accepts the operation types listed in SSSRMAP. The *units* attribute is not supported.

4.6   The *Set* Element

Set elements specify the fields to be assigned new values. *Set* elements REQUIRE the *name* attribute, and support the OPTIONAL *op* attribute. Values for all attributes are as specified in SSSRMAP. The *units* attribute is not supported.

4.7   The *Where* Element

Where elements specify the criteria for determining which objects a query acts upon. *Where* elements REQUIRE the *name* attribute, and support the OPTIONAL *op*, *conj, group, object* and *subject* attributes as specified in SSSRMAP. The *units* attribute is not supported.

4.8   The *Option* Element

The *Option* element may be used with some actions to specify special processing options. Actions that support options and the options they accept are indicated in the tables in section 5.

4.8.1 The *ShowUsage* Option

All valid object action combinations MAY support a *ShowUsage* option, which if set to *True* causes a usage response to be returned. Since this option is common to all objects and actions, it is not indicated in the Object Tables.

4.9   The *Status* Element

The *Status* element is REQUIRED in all responses.

4.9.1 The *Value* Element

The *Value* element is optional and must have a value of one of Success, Warning or Failure if present.

4.9.2 The *Code* Element

The *Code* element is required in all responses. The status codes will be set as described in the Error Reporting section.

4.9.3 The *Message* Element

The *Message* element is REQUIRED in failure responses and OPTIONAL for success responses. The content and interpretation of *Message* elements is specific to the context in which that message is issued.

4.10 The *Count* Element

The *Count* element, which is REQUIRED in all create, post, modify, delete and undelete responses, gives the number of objects successfully acted upon. The *Count* element is RECOMMENDED in all query responses to indicate the number of objects returned in the query. Other actions may use *Count* in a context-specific manner.

4.11 The *Data* Element

The *Data* element encapsulates the data results of a successful query. *Data* elements are also used in the formation of some messages (such as those that must pass structured objects like Job in the request). For responses, a *Data* element's top-level elements correspond to the objects that the query returns. These elements, in turn, contain (second-level) elements that list the fields selected from each object. The following example of a *Data* element was generated by a query over a set of *User* objects:

```
<Data>
  <User>
    <Name>scott</Name>
    <PhoneNumber>376-2205</PhoneNumber>
  </User>
  <User>
    <Name>brett</Name>
```

```
        <PhoneNumber>630-3465</PhoneNumber>
      </User>
    </Data>
```

Some actions, including *Job Charge*, *Job Reserve*, and *Job Quote*, use a request format that includes a *Data* element as an *input* parameter. The formats of *Data* elements in request messages, which differ from the format shown here, are defined by the appropriate SSS object specifications.

5. Object Tables

Tables 1-21 below define the objects supported by the Accounting and Allocation Manager component interface. Each table is divided into three sections:

- An initial, *Object* section that names the object; describes it; and specifies whether a compliant implementation of the AAM interface MUST, SHOULD or MAY support the object. These objects may also appear as child elements of a *Data* element.
- A second, *Actions* section that lists the actions the object supports; describes each action; and specifies whether a compliant implementation of the AAM interface MUST, SHOULD or MAY support the action if the object is supported. Each action supports a Usage option which, when set to true, returns as a response a usage statement indicating the supported attributes for the action.
- A final, *Attributes* section that lists and describes each of the object's attributes; gives each attribute's datatype; states whether that attribute is a primary key for its object (PK = Y); specifies whether that attribute is required for Create and Post operations (Req = Y); and specifies whether a compliant implementation of the AAM interface MUST, SHOULD or MAY support the action if the object is supported. Note: attributes that are primary keys may not be updated by *Modify* requests.

As a rule, whenever two or more objects have an attribute with the same name, that attribute has the same meaning and serves the same purpose in all of these objects. Every object, for example, has a CreationTime attribute that specifies when that object was created.

Table 1 Account object

Object	Description	Compliance
Account	A container of resource credits	SHOULD
Action	Description	Compliance
Balance	Display account balance	SHOULD
Create	Create a new account	SHOULD
Delete	Delete accounts	SHOULD
Deposit	Make a deposit (credit) into an account	SHOULD
Modify	Modify accounts	SHOULD
Query	Query accounts	MUST
Transfer	Transfer credits between accounts	SHOULD
Undelete	Undelete accounts	MAY

Withdraw	Make a withdrawal (debit) from an account				SHOULD
Attribute	Description	Type	PK	Req	Compliance
CreationTime	Time object was created	TimeStamp			SHOULD
CreditLimit	Credit limit	Integer			MAY
Deleted	Is this object deleted?	Boolean			MAY
Description	Description	String			SHOULD
Id	Account id	String	Y		SHOULD
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	Name of the account	String			SHOULD
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY

Table 2 AccountAccount association

Object	Description				Compliance
AccountAccount	Subaccount Information				MAY
Action	Description				Compliance
Create	Define a new association				SHOULD
Delete	Delete associations				SHOULD
Modify	Modify associations				SHOULD
Query	Query associations				MUST
Undelete	Undelete associations				MAY
Attribute	Description	Type	PK	Req	Compliance
Account	Parent account id	String	Y	Y	MUST
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
Id	Child account id	String	Y	Y	MUST
ModificationTime	Last time object was modified	TimeStamp			MAY
Overflow	Do charges overflow here?	Boolean			MAY
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY

Table 3 AccountMachine association

Object	Description				Compliance
AccountMachine	Machines allowed access to this account				SHOULD
Action	Description				Compliance
Create	Define a new association				SHOULD
Delete	Delete associations				SHOULD
Modify	Modify associations				SHOULD
Query	Query associations				MUST
Undelete	Undelete associations				MAY
Attribute	Description	Type	PK	Req	Compliance
Access	Access allowed? (vs. denied)	Boolean			MAY
Account	Parent account id	String	Y	Y	MUST
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	Child machine name	String	Y	Y	MUST
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY

Table 4 AccountProject association

Object	Description				Compliance
AccountProject	Projects allowed access to this account				SHOULD
Action	Description				Compliance
Create	Define a new association				SHOULD
Delete	Delete associations				SHOULD
Modify	Modify associations				SHOULD
Query	Query associations				MUST
Undelete	Undelete associations				MAY
Attribute	Description	Type	PK	Req	Compliance
Access	Access allowed? (vs. denied)	Boolean			MAY
Account	Parent account id	String	Y	Y	MUST
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	Child project name	String	Y	Y	MUST
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY

Table 5 AccountUser association

Object	Description				Compliance
AccountUser	Users allowed access to this account				SHOULD
Action	Description				Compliance
Create	Define a new association				SHOULD
Delete	Delete associations				SHOULD
Modify	Modify associations				SHOULD
Query	Query associations				MUST
Undelete	Undelete associations				MAY
Attribute	Description	Type	PK	Req	Compliance
Access	Access allowed? (vs. denied)	Boolean			MAY
Account	Parent account id	String	Y	Y	MUST
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	Child user name	String	Y	Y	MUST
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY

Table 6 AccountTimePeriod association

Object	Description				Compliance
AccountPeriod	Pool of resource credits with common expendibility time frame				SHOULD
Action	Description				Compliance
Create	Define a new association				SHOULD
Delete	Delete associations				SHOULD
Modify	Modify associations				SHOULD
Query	Query associations				MUST
Undelete	Undelete associations				MAY
Attribute	Description	Type	PK	Req	Compliance
Account	Parent account id	String	Y	Y	MUST
Amount	Amount of resource credits	Long		Y	MUST

CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	Child time period name	String	Y	Y	MUST
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY

Table 7 ChargeRate object

Object	Description				Compliance
ChargeRate	Charge rate				MAY
Action	Description				Compliance
Create	Define a new charge rate				SHOULD
Delete	Delete charge rates				SHOULD
Modify	Modify charge rates				SHOULD
Query	Query charge rates				MUST
Undelete	Undelete charge rates				MAY
Attribute	Description	Type	PK	Req	Compliance
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
Description	Description	String			SHOULD
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	Name of charge type instance	String	Y	Y	MUST
Rate	Charge rate	Float		Y	MUST
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY
Type	Charge type	String	Y	Y	MUST

Table 8 Job object

Object	Description				Compliance
Job	A job object				SHOULD
Action	Description				Compliance
Charge	Charge for a job				MUST
Create	Create a new job				SHOULD
Delete	Delete jobs				SHOULD
Modify	Modify jobs				SHOULD
Query	Query jobs				MUST
Quote	Generate a charge estimate for a job				SHOULD
Refund	Refund a job				MAY
Reserve	Create an account reservation for a job				SHOULD
Undelete	Undelete jobs				MAY
Attribute	Description	Type	PK	Req	Compliance
Application	Application type	String			MAY
Charge	Amount charged for job	Integer			MUST
Class	Class or queue	String			SHOULD
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
Description	Description	String			SHOULD
EndTime	End time	TimeStamp			MAY
Executable	Executable or script name	String			SHOULD
Id	Instance id	String	Y	Y	SHOULD

> **Comment:** The definition for this job object does not conform to the definition of the SSSRMAP job object, as described in another document. This object, for starters, appears to be a flat object, unlike its SSSRMAP counterpart. Should the discrepancy between these two definitions be discussed somewhere in this document?

JobId	Job id	String		Y	MUST
Machine	Machine name	String			SHOULD
ModificationTime	Last time object was modified	TimeStamp			MAY
Nodes	Number of nodes	Integer			SHOULD
Processors	Number of processors	Integer			MUST
Project	Project name	String			MUST
QualityOfService	Quality of service	String			MAY
RequestId	Last modifying request id	Integer			MAY
StartTime	Start time	TimeStamp			MUST
State	Job state	String			SHOULD
TransactionId	Last modifying transaction id	Integer			MAY
Type	Job type	String			MAY
User	User name	String			MUST
WallDuration	Estimated or actual wallclock time	Integer			SHOULD

Table 9 Machine object

Object	Description				Compliance
Machine	Machine, cluster or system that a job could run on				SHOULD
Action	Description				Compliance
Create	Define a new machine				SHOULD
Delete	Delete machines				SHOULD
Modify	Modify machines				SHOULD
Query	Query machines				MUST
Undelete	Undelete machines				MAY
Attribute	Description	Type	PK	Req	Compliance
Active	Is this machine active?	Boolean			SHOULD
Architecture	System architecture	String			MAY
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
Description	Description	String			SHOULD
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	Machine Name	String	Y	Y	MUST
OperatingSystem	Operating System	String			MAY
Organization	Organization Name	String			MAY
RequestId	Last modifying request id	Integer			MAY
Special	Is this a special machine?	Boolean			MAY
TransactionId	Last modifying transaction id	Integer			MAY

Table 10 Project object

Object	Description				Compliance
Project	A project				MUST
Action	Description				Compliance
Create	Create a new project				SHOULD
Delete	Delete projects				SHOULD
Modify	Modify projects				SHOULD
Query	Query projects				MUST
Undelete	Undelete projects				MAY
Attribute	Description	Type	PK	Req	Compliance
Active	Is the project active?	Boolean			SHOULD
CreationTime	Time object was created	TimeStamp			SHOULD

Deleted	Is this object deleted?	Boolean			MAY
Description	Description	String			SHOULD
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	Project Name	String	Y	Y	MUST
Organization	Organization Name	String			MAY
RequestId	Last modifying request id	Integer			MAY
Special	Is this a special project?	Boolean			MAY
TransactionId	Last modifying transaction id	Integer			MAY

Table 11 ProjectMachine association

Object	Description				Compliance
ProjectMachine	Default member machines a project can access				MAY
Action	Description				Compliance
Create	Define a new association				SHOULD
Delete	Delete associations				SHOULD
Modify	Modify associations				SHOULD
Query	Query associations				MUST
Undelete	Undelete associations				MAY
Attribute	Description	Type	PK	Req	Compliance
Active	Is this membership active	Boolean			MAY
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	Child machine name	String	Y	Y	MUST
Parent	Parent project name	String	Y	Y	MUST
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY

Table 12 ProjectUser association

Object	Description				Compliance
ProjectUser	User members of a project				MAY
Action	Description				Compliance
Create	Define a new association				SHOULD
Delete	Delete associations				SHOULD
Modify	Modify associations				SHOULD
Query	Query associations				MUST
Undelete	Undelete associations				MAY
Attribute	Description	Type	PK	Req	Compliance
Active	Is this membership active	Boolean			MAY
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	Child user name	String	Y	Y	MUST
Parent	Parent project name	String	Y	Y	MUST
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY

Table 13 Quotation object

Object	Description	Compliance
Quotation	Job charge estimate	MAY

Action	Description				Compliance
Create	Create a new quotation				SHOULD
Delete	Delete quotations				SHOULD
Modify	Modify quotations				SHOULD
Query	Query quotations				MUST
Undelete	Undelete quotations				MAY
Attribute	Description	Type	PK	Req	Compliance
Amount	Charge estimate	Integer			MUST
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
Description	Description	String			SHOULD
ExpirationTime	Time when quote expires	TimeStamp			SHOULD
Id	Quote id	String	Y		MUST
Machine	Machine name	String			MAY
ModificationTime	Last time object was modified	TimeStamp			MAY
Project	Project name	String			MAY
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY
Used	Number of times used	Integer			MAY
User	User name	String			MAY
WallDuration	Wallclock time estimate in seconds	Integer			SHOULD

Table 14 QuotationChargeRate association

Object	Description				Compliance
QuotationChargeRate	Charge rate guaranteed by a quote				MAY
Action	Description				Compliance
Create	Define a new association				SHOULD
Delete	Delete associations				SHOULD
Modify	Modify associations				SHOULD
Query	Query associations				MUST
Undelete	Undelete associations				MAY
Attribute	Description	Type	PK	Req	Compliance
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
Machine	Machine this rate applies to	String			MAY
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	Child Charge Rate name	String	Y	Y	MUST
Parent	Parent Quote id	String	Y	Y	MUST
Rate	Guaranteed Charge Rate	Float		Y	MUST
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY
Type	Child Charge Rate type	String	Y	Y	SHOULD

Table 15 Reservation object

Object	Description	Compliance
Reservation	Charge reservation	MAY
Action	Description	Compliance
Create	Create a new reservation	SHOULD
Delete	Delete reservations	SHOULD
Modify	Modify reservations	SHOULD

Query	Query reservations				MUST
Undelete	Undelete reservations				MAY
Attribute	Description	Type	PK	Req	Compliance
Amount	Reservation balance	Integer			MUST
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
Description	Description	String			SHOULD
ExpirationTime	Time when reservation expires	TimeStamp			SHOULD
Id	Reservation id	String	Y	Y	MUST
JobId	Job id	String		Y	MUST
ModificationTime	Last time object was modified	TimeStamp			MAY
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY

Table 16 ReservationAccount association

Object	Description				Compliance
ReservationAccount	Amount of account contributing toward reservation				MAY
Action	Description				Compliance
Create	Define a new association				SHOULD
Delete	Delete associations				SHOULD
Modify	Modify associations				SHOULD
Query	Query associations				MUST
Undelete	Undelete associations				MAY
Attribute	Description	Type	PK	Req	Compliance
Amount	Resource credits	Integer		Y	MUST
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
Id	Child allocation id	String	Y	Y	MUST
ModificationTime	Last time object was modified	TimeStamp			MAY
Parent	Parent reservation id	String	Y	Y	MUST
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY

Table 17 System object

Object	Description				Compliance
System	The information manager itself				SHOULD
Action	Description				Compliance
Create	Define a new system				MAY
Delete	Delete systems				MAY
Modify	Modify systems				SHOULD
Query	Query systems				MUST
Undelete	Undelete systems				MAY
Attribute	Description	Type	PK	Req	Compliance
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
Description	Description	String			SHOULD
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	System Name	String	Y	Y	MUST
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY

Version	System Version	String		Y	MUST

Table 18 TimePeriod object

Object	Description				Compliance
System	A named time frame				SHOULD
Action	Description				Compliance
Create	Define a new time period				MAY
Delete	Delete time periods				MAY
Modify	Modify time periods				SHOULD
Query	Query time periods				MUST
Undelete	Undelete time periods				MAY
Attribute	Description	Type	PK	Req	Compliance
Active	Is this time period currently active?	Boolean			MAY
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
Description	Description	String			SHOULD
EndTime	When does this time period end	TimeStamp		Y	MUST
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	System Name	String	Y	Y	MUST
RequestId	Last modifying request id	Integer			MAY
StartTime	When does this time period start	TimeStamp		Y	MUST
TransactionId	Last modifying transaction id	Integer			MAY

Table 19 Transaction object

Object	Description				Compliance
System	Transaction log				SHOULD
Action	Description				Compliance
Create	Post a new transaction				MAY
Delete	Delete a transaction				MAY
Modify	Modify a transaction				MAY
Query	Query transactions				MUST
Redo	Redo an undone transaction				MAY
Undelete	Undelete transactions				MAY
Undo	Undo a transaction (or multiple)				MAY
Attribute	Description	Type	PK	Req	Compliance
Account	Account id	String			SHOULD
Action	Action	String		Y	MUST
Actor	Authenticated user requesting action	String		Y	SHOULD
Amount	Amount specified in request	Integer			MAY
Child	Association child name	String			MAY
Count	Object count acted upon	Integer			MAY
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
Delta	Amount balance was affected	Integer			MAY
Description	Description	String			SHOULD
Details	Transaction details	String			MAY
Id	Transaction record id	String	Y	Y	MUST
JobId	Job id	String			MUST
Machine	Machine name	String			SHOULD
ModificationTime	Last time object was modified	TimeStamp			MAY

Name	Object instance name	String			MUST
Object	Object name	String		Y	MUST
Project	Project name	String			SHOULD
RequestId	Last modifying request id	Integer			MAY
TransactionId	Last modifying transaction id	Integer			MAY
User	User name	String			MUST

Table 20 Usage object

Object	Description				Compliance
Usage	Resources utilized by jobs				MAY
Action	Description				Compliance
Create	Post a new usage record				MUST
Delete	Delete a transaction				MAY
Modify	Modify a transaction				MAY
Query	Query usage records				MUST
Undelete	Undelete transactions				MAY
Attribute	Description	Type	PK	Req	Compliance
Amount	Amount of resource utilized	Integer		Y	MUST
Charge	Charge applied to Job	Integer			SHOULD
ChargeRate	Charge rate applied	Float			SHOULD
ConsumptionRate	Resource consumption rate	Float			MAY
CreationTime	Time object was created	TimeStamp			SHOULD
Deleted	Is this object deleted?	Boolean			MAY
Description	Description	String			SHOULD
Id	Usage record id	String	Y		SHOULD
JobId	Job id	String		Y	MUST
Machine	Machine resource was used on	String			SHOULD
ModificationTime	Last time object was modified	TimeStamp			MAY
Multiplier	Charge rate multiplier applied	Float			MAY
RequestId	Last modifying request id	Integer			MAY
Resource	Resource type used	String		Y	MUST
TransactionId	Last modifying transaction id	Integer			MAY
WallDuration	Wallclock time used in seconds	Integer			MUST

Table 21 User object

Object	Description				Compliance
User	A user				MUST
Action	Description				Compliance
Balance	Return user balance				MAY
Create	Create a new user				SHOULD
Delete	Delete users				SHOULD
Modify	Modify users				SHOULD
Query	Query users				MUST
Undelete	Undelete users				MAY
Attribute	Description	Type	PK	Req	Compliance
Active	Is the user active?	Boolean			SHOULD
CommonName	Full Name	String			MAY
CreationTime	Time object was created	TimeStamp			SHOULD
DefaultProject	Project used when unspecified	String			MAY
Deleted	Is this object deleted?	Boolean			MAY

Description	Description	String			SHOULD
EmailAddress	Email address	String			MAY
ModificationTime	Last time object was modified	TimeStamp			MAY
Name	User id	String	Y	Y	MUST
Organization	Organization name	String			MAY
PhoneNumber	Phone number	String			MAY
RequestId	Last modifying request id	Integer			MAY
Special	Is this a special user?	Boolean			MAY
TransactionId	Last modifying transaction id	Integer			MAY

6. Error Reporting

Conforming components MUST set the Code element using values defined in the SSSRMAP Message Format specifications. At a minimum, Successful responses can set the *Code* element content to 000 while Failure responses can be set to 999, indicating an unknown failure. However, more specific error codes are highly recommended. All failures MUST be accompanied by a context-specific message indicating the reason for failure. No component-specific codes are defined.

7. Examples of Message Format

Activate the sss project:

```
<Request action="Modify" actor="scott">
   <Object>Project</Object>
   <Set name="Active">True</Set>
   <Where name="Name">sss</Where>
</Request>
```

Ask for the phone numbers of all Jacksons

```
<Request action="Query" actor="scott">
   <Object>User</Object>
   <Get name="PhoneNumber"></Get>
   <Where name="Name" op="Match">*Jackson*</Where>
</Request>
```

Delete Reservation for job PBS.1234.0:

```
<Request action="Delete" actor="scott">
   <Object>Reservation</Object>
   <Where name="JobId">PBS.1234.0</Where>
</Request>
```

Issue a Job Charge:

```xml
<Request action="Charge" actor="scott">
    <Object>Job</Object>
    <Data>
            <Job>
                    <JobId>PBS.1234.0</JobId>
                    <ProjectId>sss</ProjectId>
                    <UserId>scott</UserId>
                    <MachineName>MPP2</MachineName>
                    <Processors>32</Processors>
                    <WallDuration>3600</WallDuration>
            </Job>
    </Data>
</Request>
```